The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of determining susceptibility to bone fracture in a mammalian subject comprising at least one estrogen receptor α gene comprising a *Pvu*II site and a *Xba*I site, wherein the *Pvu*II site can exist as a P or p allelic form, and the *Xba*I site can exist as an X or x allelic form, said method comprising analyzing nucleic acid molecules obtained from the mammalian subject to determine which of the P,p X, and x alleles of the estrogen receptor α gene are present, wherein the presence of a haplotype comprising the p and x alleles is indicative of an increased susceptibility to bone fracture.

2. A method of determining susceptibility to bone fracture according to Claim 1, said method comprising analyzing nucleic acid molecules of the mammalian subject to determine whether the px haplotype of the estrogen receptor α gene is present, wherein the presence of said px haplotype is indicative of an increased susceptibility to bone fracture.

3. A method of determining susceptibility to bone fracture according to Claim 1 or Claim 2, said method further comprising analyzing nucleic acid molecules of the mammalian subject to determine whether an allele of a vitamin D receptor gene is present which allele is indicative of an increased susceptibility to bone fracture.

4. A method of determining susceptibility to bone fracture according to Claim 3, wherein the vitamin D receptor gene comprises a BsmI site, an ApaI site and a TaqI site, wherein the BsmI site can exist as a B or b allelic form, the ApaI site can exist as an A or a allelic form, and the TaqI site can exist as a T or t allelic form, the method comprising analyzing nucleic acid molecules of the mammalian subject to determine which of the B, b, A, a, T, and t alleles of the *Bsm*I, *Apa*I and *Taq*I sites of the vitamin D receptor gene are present, wherein the presence of a haplotype comprising at least one of the b,a, and T alleles is indicative of an increased susceptibility to bone fracture.

5. A method of determining bone fracture according to Claim 4, said method comprising analyzing nucleic acid molecules of the mammalian subject to determine

whether a baT haplotype of the vitamin D receptor gene is present, wherein the presence of said baT haplotype is indicative of an increased susceptibility to bone fracture.

6. A method of determining susceptibility to bone fracture according to Claim 4, said method further comprising determining the copy number of a member of the group consisting of the P, p, X and x alleles of the estrogen receptor α gene and the B, b, A, a, T and t alleles of the vitamin D receptor gene.

7. A method according to Claim 4 comprising comparing the estrogen receptor α gene alleles or vitamin D receptor gene alleles present in the mammalian subject with genotypes of the estrogen receptor α or vitamin D receptor genes having known degrees of risk of bone fracture.

8. A method according to Claim 1, wherein said method is performed *in vitro*.

9. A method according to Claim 8, wherein said method is performed on a blood or tissue sample of a subject.

10. The method of Claim 1 wherein the mammalian subject is suffering from low bone mineral density.

11. The method of Claim 1 wherein the mammalian subject has a normal level of bone mineral density.

12. A method of treating a mammalian subject to prevent or reduce the risk of bone fracture, wherein the mammalian subject comprises at least one estrogen receptor α gene comprising a *Pvu*II site and a *Xba*I site, wherein the *Pvu*II site can exist as a P or p allelic form, and the *Xba*I site can exist as an X or x allelic form, the method comprising analyzing nucleic acid molecules obtained from the mammalian subject to determine which of the P, p, X and x alleles of the *Pvu*II and *Xba*I sites of the estrogen receptor α gene are present, wherein the presence of a haplotype comprising the p and x alleles is indicative of an increased susceptibility to bone fracture, and treating the mammalian subject to reduce the risk of bone fracture if the subject has a haplotype comprising the p and x alleles.

13. A method of treating a subject to prevent or reduce the risk of bone fracture according to Claim 12 further comprising analyzing nucleic acid molecules of the mammalian subject to determine whether the px haplotype of the estrogen receptor α gene is present, wherein the presence of the px haplotype is indicative of an increased susceptibility to bone fracture.

14. A method of treating a mammalian subject to prevent or reduce the risk of bone fracture according to Claim 12 or Claim 13 further comprising analyzing nucleic acid molecules of the mammalian subject to determine which of the B, b, A, a, T and t alleles of the *Bsm*I, *Apa*I and *Taq*I sites of the vitamin D receptor gene are present, wherein the presence of a haplotype comprising at least one of the b, a, and T alleles is indicative of an increased susceptibility to bone fracture.

15. A method of treating a subject to prevent or reduce the risk of bone fracture according to Claim 12 or Claim 13 further comprising analyzing nucleic acid molecules of the mammalian subject to determine whether the baT haplotype of the vitamin D receptor gene is present, wherein the presence of the baT haplotype is indicative of an increased susceptibility to bone fracture.

16. A method of treating a subject to prevent or reduce the risk of bone fracture according to Claim 12, said method further comprising determining the copy number of a member of the group consisting of the P, p, X and x alleles of the estrogen receptor α gene and the B, b, A, a, T and t alleles of the vitamin D receptor gene, before treating the subject to reduce the risk of bone fracture if the subject has a haplotype comprising the p and x alleles of the estrogen receptor α gene.

17. A method according to Claim 16 comprising comparing the estrogen receptor α gene alleles or vitamin D receptor gene alleles present in the mammalian subject with genotypes of the estrogen receptor α or vitamin D receptor genes having known degrees of risk of bone fracture.

18. A method according to Claim 13, wherein the treatment comprises at least one of modifications to lifestyle, regular exercise, changes in diet and administration of a pharmaceutical preparation effective to prevent or reduce the risk of bone fracture.

19. A method according to Claim 1 or Claim 12, wherein the subject is a human.

20. A method according to Claim 19 wherein the subject is female.

21. A method of formulating a treatment regimen to decrease the risk of bone fracture in a mammalian subject, said method comprising analyzing nucleic acid molecules of a mammalian subject to determine whether a px haplotype of an estrogen receptor α gene is present, wherein said haplotype is associated with risk of bone fracture, and formulating a treatment regimen to decrease the risk of bone fracture in the mammalian subject.

22. A method of formulating a treatment regimen to decrease the risk of bone fracture according to Claim 21, the method further comprising analyzing nucleic acid molecules of the mammalian subject to determine whether a baT haplotype of the vitamin D receptor gene is present in the mammalian subject, wherein said haplotype is associated with risk of bone fracture, and formulating a treatment regimen to decrease the risk of bone fracture if said haplotype is present in the mammalian subject.

23. A method of formulating a treatment regimen to decrease the risk of bone fracture according to Claim 21 comprising comparing the estrogen receptor α gene alleles or vitamin D receptor gene alleles present in the mammalian subject with genotypes of the estrogen receptor α or vitamin D receptor genes having known degrees of risk of bone fracture.

24. A method according to any of Claims 21 to 23, further comprising administering an appropriate treatment effective to decrease the risk of bone fracture.

25. A method of determining susceptibility to bone fracture in a mammalian subject comprising the step of utilizing a kit to determine whether a px haplotype of an estrogen receptor α gene is present in a mammalian subject, wherein said kit comprises (i) one or more nucleic acid primer molecules for amplification of a portion of the estrogen receptor α gene, (ii) means for determining whether the px haplotype of said gene is present, and (iii) means for indicating a correlation between the presence of the px

haplotype and risk of bone fracture, and wherein the presence of the px haplotype in the mammalian subject is indicative of susceptibility to bone fracture.

26. The method according to Claim 25 further comprising the step of determining whether a baT haplotype of a vitamin D receptor gene is present in the mammalian subject, said kit further comprising (i) one or more nucleic acid primer molecules for amplification of a portion of the vitamin D receptor gene, (ii) means for determining whether the baT haplotype of the vitamin D receptor gene is present, and (iii) means for indicating a correlation between the presence of the baT haplotype and risk of bone fracture.

27. A kit for determining susceptibility to bone fracture in a mammalian subject, said kit comprising (i) one or more nucleic acid primer molecules for amplification of a portion of an estrogen receptor α gene, (ii) means for determining whether a px haplotype of said gene is present; and (iii) means for indicating a correlation between the presence of said haplotype and risk of bone fracture.

28. A kit according to Claim 27, said kit further comprising (i) one or more nucleic acid primer molecules for amplification of a portion of a vitamin D receptor gene, (ii) means for determining whether a baT haplotype of the vitamin D receptor gene is present, and (iii) means for indicating a correlation between the presence of the baT haplotype and risk of bone fracture.

29. A method according to Claim 1, wherein the presence of the haplotype is determined by amplification of a portion of the first intron of the estrogen receptor α gene to yield an amplified fragment, followed by restriction enzyme digestion of the amplified fragment.

30. A method according to Claim 29, further comprising determining the haplotype of a vitamin D receptor gene by amplification of a portion of the vitamin D receptor gene between exon 7 and the 3' untranslated region to yield an amplified fragment, followed by restriction enzyme digestion of the amplified fragment.